LITERATURE REVIEW

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Presentation:

This document contains the results of a literature review focused on understanding knowledge and practices on dental treatment protocols that researchers at Università degli Studi di Palermo plan to standardise, including those published by professional organisations, government agencies, and academic institutions in Italy. The reviewed literature covers documents from the last 15 years. While it provides a general overview of European Union or nation-wide best practice studies conducted across Europe to reflect the European perspective, the literature review mostly focuses on documents produced in Italy. The literature includes studies published in English and Italian.

According to the structure proposed in the application form, this review is made up of three sections:

1) An overview of the dental treatment protocols in Europe and Italy;
2) Review of the best practices and evidence-based recommendations in Europe and Italy to help ensure that the dental treatment protocols are based on the latest research and knowledge in the field
3) Review of the improvement areas evident from the literature. (Regarding the education of DTPs)

A similar strategy was used in each of the sub-topics of the literature review addressed in sections 1, 2 and 3 as follows.

SECTION 1

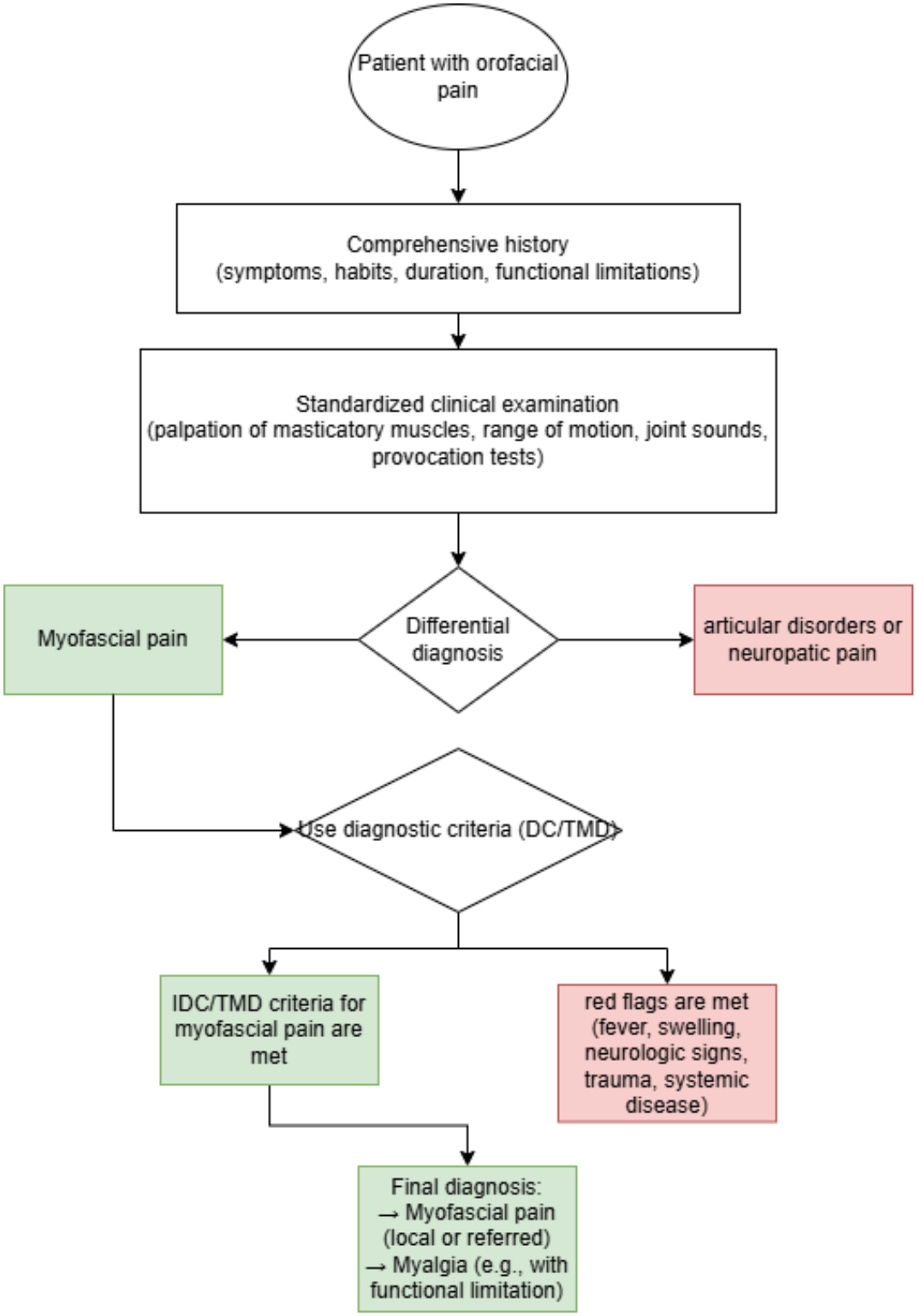
This section provides an overview of existing dental treatment protocols, specifically focusing on the diagnosis and management of myogenic temporomandibular disorders (TMDs), both in Italy and across Europe. Given the high prevalence and significant impact of TMDs on patients' quality of life, standardized and evidence-based protocols are crucial to ensure effective and consistent care.

In Italy, national clinical recommendations, such as those published by the Ministry of Health, serve as foundational documents aimed at standardizing odontostomatological practice. While these guidelines provide essential principles, it is important to note that the existing Italian protocols for TMDs, last updated in 2017, may present limitations in terms of their specificity and currentness when compared to the rapidly evolving body of scientific evidence and more detailed international consensus papers.

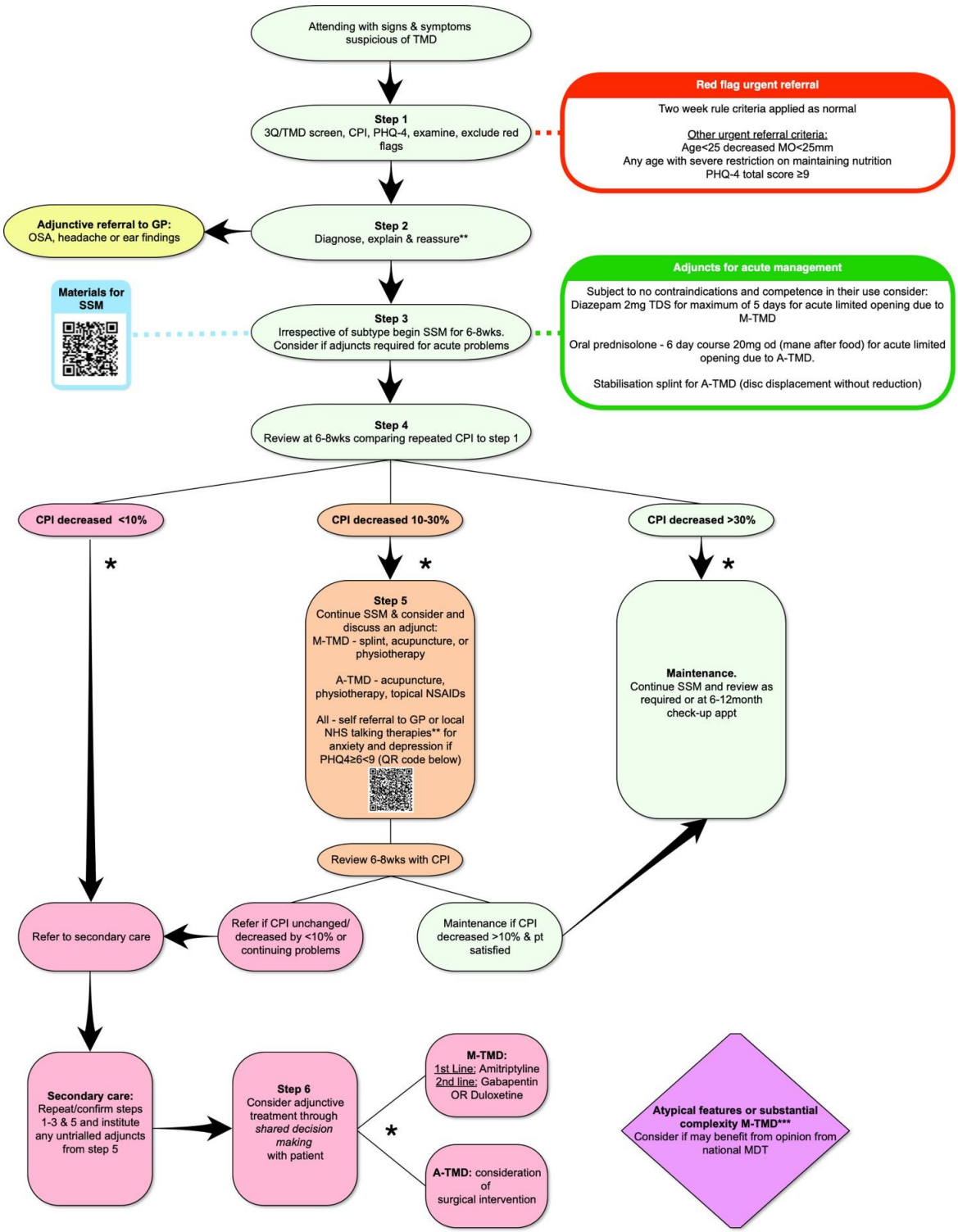
Several European and international organizations have contributed to the standardization of clinical protocols for the management of temporomandibular disorders of muscular origin. Notably, the International Network for Orofacial Pain and Related Disorders Methodology (INfORM) in collaboration with the International Association for Dental Research (IADR) has published key points for good clinical practice based on the current standard of care. Similarly, the National Health Service (NHS) England, through its Getting It Right First Time (GIRFT) programme and the Royal College of Surgeons' Faculty of Dental Surgery, has developed clinical guidelines specifically addressing the management of painful TMDs in adults.

These documents emphasize a conservative, stepwise, and biopsychosocial approach to the diagnosis and treatment of myogenic TMDs. They prioritize accurate clinical assessment, patient education, behavioral strategies, and physical therapies, while advising against irreversible procedures such as occlusal adjustments or pharmacologic injections. The consistency between these recommendations reinforces the adoption of non-invasive, evidence-based protocols across Europe.

Diagnostic pathway for myogenic TMD



Evidence based TMD care pathway



NHS England & Royal College of Surgeons of England. Management of painful temporomandibular disorder in adults – Comprehensive guideline. March 2024. Figure 3: Evidence-based TMD care pathway.

SECTION 2

Best Practices and Evidence-Based Recommendations

In this section we will analyze the best practices regarding diagnosis and treatments for muscolary TMDs.

Standardized Diagnostic Approach

1. **Patient History**
   - **Key components**:
     - Onset, duration, and progression of symptoms (e.g., pain, clicking, limited jaw movement).
     - Pain characteristics (location, intensity, triggers, alleviating factors).
     - History of trauma, parafunctional habits (e.g., bruxism), or systemic conditions (e.g., fibromyalgia, migraines).
     - Psychosocial factors (stress, anxiety, depression).
2. **Clinical Examination**
   - **Physical assessment**:
     - Palpation of masticatory muscles (masseter, temporalis, lateral pterygoid) and TMJ for tenderness or hypertrophy.
     - Evaluation of jaw range of motion (opening, lateral excursions, protrusion).
     - Auscultation for joint sounds (clicking, crepitus).
   - **Functional tests**:
     - Provocation tests to reproduce symptoms (e.g., clenching, resisted movements).
3. **Diagnostic Criteria**

The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) is the gold standard, classifying TMD into:

1. Myogenous TMD: Primary muscle pain (e.g., myalgia, myofascial pain).
2. Arthrogenous TMD: Joint-related disorders (e.g., disc displacement, osteoarthritis).
3. Combined TMD: Mixed muscle and joint involvement.

Example diagnoses:

- *"Myogenous TMD affecting bilateral masseters, comorbid with tension-type headaches."*
- *"Arthrogenous TMD with disc displacement without reduction, comorbid with sleep dysfunction."*

4. **Adjunctive Diagnostics**
   - Imaging: MRI for soft tissue evaluation (e.g., disc position); CBCT for bony changes.
   - Psychosocial screening: Tools like PHQ-9 or GAD-7 to assess comorbid anxiety/depression.

Best Practices in Management

1. Conservative Therapies (First-Line)

- **Patient education**:
  - Reassurance about benign nature of TMD.
  - Behavioral modifications (e.g., stress management, habit reversal).
- **Pharmacotherapy**:
  - NSAIDs (short-term for pain/inflammation).
  - Muscle relaxants (e.g., cyclobenzaprine for acute myalgia).
  - Low-dose antidepressants (e.g., amitriptyline for chronic pain).
- **Physical therapies**:
  - Jaw exercises (e.g., controlled opening/stretching).
  - Manual therapy (e.g., mobilization, trigger point release).
  - Thermal modalities (heat/cold packs).

2. Occlusal Appliances

- **Stabilization splints**: Flat-plane splints for myogenous TMD (evidence grade: moderate).
- **Anterior bite splints**: For disc displacement with reduction.
- *Avoid irreversible occlusal adjustments*.

3. Interdisciplinary Care

- **Psychological support**: CBT for pain catastrophizing or sleep disturbances.
- **Collaboration with specialists**: Rheumatology (for systemic arthritis), neurology (for migraines).

4. Surgical Interventions (Last Resort)

- Indications: Refractory joint pathology (e.g., advanced osteoarthritis).
- Options: Arthrocentesis, arthroscopy, open joint surgery.

SECTION 3

The field of temporomandibular disorder management finds itself at a crossroads, where despite decades of research and clinical experience, significant challenges persist that hinder optimal patient care. One of the most pressing issues remains the lack of standardized diagnostic protocols across different clinical settings and geographical regions. In daily practice, we still encounter clinicians who rely heavily on subjective clinical impressions rather than adopting evidence-based frameworks like the DC/TMD criteria. This inconsistency in diagnostic approaches inevitably leads to variability in treatment outcomes and makes comparative research challenging.

Another critical gap lies in the underappreciation of psychosocial comorbidities in TMD patients. While the research literature consistently demonstrates the strong association between TMD symptoms and factors like chronic stress, anxiety disorders, and sleep disturbances, these elements often receive inadequate attention in clinical practice. Many treatment plans still focus predominantly on the mechanical aspects of TMD without adequately addressing the psychological components that may be driving or perpetuating the condition. This oversight is particularly problematic for patients with chronic TMD presentations, where the biopsychosocial model should ideally form the cornerstone of management.

Technological Advancements: The Promise and Challenges of EMG Monitoring

The emergence of innovative diagnostic technologies, particularly portable EMG devices represents a significant leap forward in our ability to understand and manage TMD-related muscle activity. These ambulatory monitoring systems offer several distinct advantages over traditional assessment methods:

1. **Comprehensive Activity Profiling**: Unlike single-point clinical assessments or even polysomnography, these devices provide continuous 24-hour monitoring of masseter muscle activity, capturing both awake and sleep bruxism patterns in the patient's natural environment.
2. **Quantitative Metrics**: The development of indices like the Bruxism Work Index (BWI) and Bruxism Time Index (BTI) moves us beyond simple event counting to more meaningful measures of actual muscle workload and temporal patterns.

3. **Clinical Correlation**: By correlating EMG findings with patient-reported symptoms and clinical examination, we can develop more personalized treatment strategies. For instance, a patient presenting with morning masticatory muscle pain might show elevated BTI during sleep phases, suggesting sleep bruxism as a contributing factor.

However, the integration of these technologies into routine practice faces several barriers:

- Cost and Accessibility: Currently, these advanced monitoring systems remain relatively expensive and may not be readily available in all clinical settings.
- Interpretation Challenges: Clinicians require specific training to properly interpret the complex data these devices generate, and there's a need for more established normative values for comparison.
- Validation Needs: While preliminary studies like the Dia-BRUXO research show promise, larger validation studies across diverse patient populations are still needed.

Educational Reform: The current state of TMD education reveals alarming gaps across international dental curricula. Both the European Academy of Craniomandibular Disorders (EACD) and American Academy of Orofacial Pain (AAOP) identify a critical mismatch between the high prevalence of TMDs (affecting 20-40% of the population) and the inadequate training provided to dental students. This educational deficit manifests clinically as underdiagnosis, misdiagnosis, or inappropriate biomechanical interventions that ignore the biopsychosocial model now recognized as essential for effective TMD care.

A Unified Framework for TMD Education

Building on both EACD and AAOP guidelines, dental curricula should implement these core enhancements:

1. **Integrated Basic Science Teaching**
    - *Early curriculum integration*: Teach masticatory system anatomy and physiology with emphasis on functional relationships and dysfunction pathways.
    - *Pain neuroscience modules*: Specific focus on orofacial nociception mechanisms and central sensitization.
    - *Psychosocial components*: Stress-symptom cycles, anxiety-pain interactions, and sleep disturbance correlations.
2. **Clinical Skills Development**

- *Hands-on training in*:
  - DC/TMD examination protocols (muscle palpation, joint auscultation, mandibular movement analysis).
  - Differential diagnosis from dental/orofacial pain conditions.
  - Basic management strategies (occlusal appliance adjustment, physical therapy referrals).

3. **Multidisciplinary Perspective**
   - *Collaborative teaching* with psychologists, physiotherapists, and sleep specialists.
   - *Referral pathway training*: When and how to consult orofacial pain specialists.

Despite CODA's 2020 mandate (US) and EACD recommendations (Europe), adoption faces challenges:

- Faculty knowledge gaps: Prioritize DC/TMD certification programs for educators.
- Curricular constraints: Integrate TMD topics vertically (e.g., discuss TMD risks during restorative courses).
- Lack of clinical exposure: Use standardized patient encounters with TMD case simulations.

Future directions: Develop international competency standards and open-access teaching resources to bridge these gaps.

REFERENCES

First title: Diagnosis and Management Protocols for Muscle-Related Temporomandibular Disorders (TMDs)

- **Title of the document** RACCOMANDAZIONI CLINICHE IN ODONTOSTOMATOLOGIA
- **Journal:** MINISTERO DELLA SALUTE
- **Year of publication:** 2017
- **Authors:** Working Group established within the Technical Coordination Table for Dentistry
- **Link:** https://www.salute.gov.it/imgs/C_17_pubblicazioni_2637_allegato.pdf
- **Extended summary** This official document by the Italian Ministry of Health serves as a foundational reference for clinical practice across various fields of odonto-stomatology in Italy. Specifically, Section V (pages 201-209) is dedicated to "Disordini Temporo Mandibolari (DTM) e Dolore Orofacciale (DOF)," which encompasses the field of Gnathology as it relates to these conditions. This section provides a structured overview of national protocols for the diagnosis and initial management of TMDs and Orofacial Pain. It outlines key definitions, epidemiological data, etiological factors, and classifications relevant to these complex disorders. Furthermore, the document presents clinical pathways for patient assessment, including history taking and physical examination, and proposes broad therapeutic strategies. These include conservative, non-pharmacological interventions (such as patient education and self-care), pharmacological management (e.g., NSAIDs, muscle relaxants), and considerations for more invasive treatments when indicated. While offering essential principles for the Italian dental practitioner to standardize the initial approach to TMDs, this section serves as a general guideline within a broader dental context, aiming to promote evidence-based understanding and basic management of gnathological issues within the national healthcare system.

- **Title of the document:** Management of painful Temporomandibular disorder in adults
- **Journal:** NHS England Getting It Right First Time (GIRFT) and Royal College of Surgeons' Faculty of Dental Surgery
- **Year of publication:** 2024
- **Authors:** NHS England Getting It Right First Time (GIRFT) and Royal College of Surgeons' Faculty of Dental Surgery
- **Link:** https://www.rcseng.ac.uk/-/media/FDS/Comprehensive-guideline-Management-of-painful-Temporomandibular-disorder-in-adults-March-2024.pdf
- **Extended summary** This comprehensive guideline, developed by NHS England's Getting It Right First Time (GIRFT) program in collaboration with the Royal College of Surgeons' Faculty of Dental Surgery, provides an evidence-based framework for the management of painful Temporomandibular Disorder (TMD) in adults across the United Kingdom. Published in 2024, it outlines a structured and clear pathway for care provision, aiming to improve patient outcomes and reduce the impact of persistent TMD pain. The document covers a range of topics including screening, diagnosis (often utilizing tools like 3Q/TMD and CPI), red flag identification for serious underlying pathologies, and a detailed overview of non-invasive treatment options. These include patient education, self-management strategies, various types of occlusal splints, jaw exercises, and physiotherapy techniques. The guideline emphasizes a stepped-care approach and the importance of assessing biopsychosocial factors. As a recent and comprehensive national guideline from a major European country, it reflects current best practices and offers a detailed perspective on the clinical management of TMDs within a structured healthcare system.

- **Title of the document:** Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group
- **Journal:** Journal of Oral & Facial Pain and Headache
- **Year of publication:** 2014
- **Authors:** Eric Schiffman, et al.

- **Link:** https://files.jofph.com/files/article/20231214-383/pdf/ofph_28_1_Schiffman_02.pdf
- **Extended summary** This landmark publication presents the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), which represent the global standard for the standardized assessment and classification of TMDs for both clinical and research purposes. Developed by the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group, this comprehensive document provides a dual-axis diagnostic system: Axis I focuses on physical diagnoses of TMDs (including specific muscular and joint conditions), while Axis II assesses psychosocial status and pain-related disability. The DC/TMD protocol includes detailed operational criteria, standardized examination procedures, and decision trees, ensuring high reliability and validity in diagnosing specific TMDs, particularly those of myogenic origin (e.g., myalgia, myofascial pain). This framework is crucial for evidence-based practice, guiding clinicians in making precise diagnoses, tailoring treatment plans, and enabling comparable research outcomes worldwide. It is considered an essential 'best practice' for any thorough diagnostic evaluation of temporomandibular disorders.

- **Title of the document:** Temporomandibular disorders: INFORM/IADR key points for good clinical practice based on standard of care
- **Journal:** CRANIO®: The Journal of Craniomandibular & Sleep Practice
- **Year of publication:** 2024
- **Authors**: Daniele Manfredini, Birgitta Häggman-Henrikson, Ahmad Al Jaghsi, Lene Baad-Hansen, Emma Beecroft, Tessa Bijelic, Alessandro Bracci, Lisa Brinkmann, Rosaria Bucci, Anna Colonna, Malin Ernberg, Nikolaos N. Giannakopoulos, Susanna Gillborg, Charles S. Greene, Gary Heir, Michail Koutris, Axel Kutschke, Frank Lobbezoo, Anna Lövgren, Ambra Michelotti, Donald R. Nixdorf, Laura Nykänen, Juan Fernando Oyarzo, Maria Pigg, Matteo Pollis, Claudia C. Restrepo, Roberto Rongo, Marco Rossit, Ovidiu I. Saracutu, Oliver Schierz, Nikola Stanisic, Matteo Val, Merel C. Verhoeff, Corine M. Visscher, Ulle Voog-Oras, Linnéa Wrangstål, Steven D. Bender, Justin Durham & International Network for Orofacial Pain and Related Disorders Methodology

- **Link:** https://www.tandfonline.com/doi/10.1080/08869634.2024.2405298?url_ver=Z39.88-2003
- **Extended summary** This contemporary consensus paper, developed by the International Network for Orofacial Pain and Related Disorders Methodology (INFORM/IADR), presents a crucial overview of key points for good clinical practice in the management of temporomandibular disorders (TMDs), grounded in the current standard of care. With contributions from a large international group of experts, including prominent European researchers, the document aims to provide clear, actionable guidance for dental professionals. It covers essential aspects of TMD management, emphasizing patient-centered approaches, evidence-based diagnostic criteria, and a spectrum of non-invasive therapeutic interventions. The paper consolidates contemporary knowledge and expert consensus, making it a valuable reference for understanding the current foundational principles and global perspectives on TMD care.

- **Title of the document:** Curriculum guidelines for orofacial pain and temporomandibular disorders
- **Journal:** European Academy of Craniomandibular Disorders
- **Year of publication:** 2001
- **Authors:** Maria Nilner
- **Link:** https://onlinelibrary.wiley.com/doi/abs/10.1034/j.1600-0579.2001.050308.x
- **Extended summary** This seminal document, published by the European Academy of Craniomandibular Disorders (EACD) in the European Journal of Dental Education in 2001, provides foundational curriculum guidelines for both undergraduate and postgraduate programmes in stomatognathic physiology, orofacial pain, and temporomandibular disorders (TMD) at dental schools in Europe. It outlines essential attainment, competence, and attitude goals for dental students, covering basic anatomy, physiology, diagnosis, and conservative treatment procedures such as occlusal stabilization, relaxation therapy, and jaw exercises. Crucially, as of current review, this 2001 publication remains one of the most prominent and comprehensive European documents specifically outlining undergraduate educational requirements for TMDs and orofacial pain. While it established a vital framework, its age inherently presents a significant area for

improvement in contemporary dental curricula. The guidelines predate major advancements in TMD research, diagnostic methodologies (e.g., DC/TMD Axis I and II), and refined evidence-based therapeutic approaches. This highlights the pressing need for updated European educational guidelines to ensure that future dental professionals receive training aligned with the latest scientific understanding and clinical best practices in TMD management.

- **Title of the document:** Temporomandibular Disorders Core Curriculum for Predoctoral Dental Education: Recommendations from the American Academy of Orofacial Pain
- **Journal:** Journal of Oral & Facial Pain and Headache
- **Year of publication:** 2021
- **Authors:** AAOP Committee on TMD Predoctoral Education
- **Link:** https://files.jofph.com/files/article/20231204-47/pdf/ofph_35_4_Chen_3073_p271.pdf
- **Extended summary** This significant document, published in 2021 by the American Academy of Orofacial Pain (AAOP), provides a comprehensive and modern framework for the core curriculum of temporomandibular disorders (TMDs) in predoctoral (undergraduate) dental education. It meticulously outlines the essential knowledge, skills, and attitudes that all graduating dental students should attain to effectively diagnose, assess, and manage basic TMD conditions. The recommendations span from patient history and clinical examination to differential diagnosis and the implementation of initial conservative therapies, aligning with a contemporary biopsychosocial understanding of TMDs. This curriculum serves as a critical benchmark, reflecting current evidence-based approaches to TMD education. Its recent publication highlights the evolving nature of the field and implicitly underscores the potential need for similar updated and specific curriculum guidelines within European dental education frameworks to ensure that dental graduates are thoroughly prepared to address the complexities of TMDs in modern clinical practice.